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DWARF MISTLETOE SURVEY OF BUREAU OF LAND MANAGEMENT'S SALMON DISTRICT

By

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INTRODUCTION

Dwarf mistletoes are diminutive, parasitic plants infecting conifers of all age classes. Infections cause reduction of vigor, growth rate, and wood quality; and in severe cases mortality. Reduced host vigor can often render the infected trees susceptible to bark beetle attacks.

Although dwarf mistletoes are considered to be the most damaging disease agents in the Intermountain Region, extent of damage directly attributed to dwarf mistletoe infection has been quantified only for the Region's National Forest lands (Hoffman and Hobbs 1979). Therefore, in response to a request from USDI, Bureau of Land Management's (BLM) Salmon District, their District was surveyed during the summer of 1979 to assess incidence of and volume reduction due to lodgepole pine dwarf mistletoe, Arceuthobium americanum Nutt. ex Engelm., on lodgepole pine, Pinus contorta Dougl. ex Loud. In addition, incidence intensity information was collected for Douglas-fir dwarf mistletoe, Arceuthobium douglasii Engelm., on Douglas-fir, Pseudotsuga menziesii (Mirb.) Franco.

METHODS

Survey Procedures

General survey procedures were a modification of a previously developed dwarf mistletoe loss assessment survey (Drummond 1978). Modifications were necessary to accomodate the scattered road systems and commercial forest land parcels of BLM's Salmon District (Figure 1).

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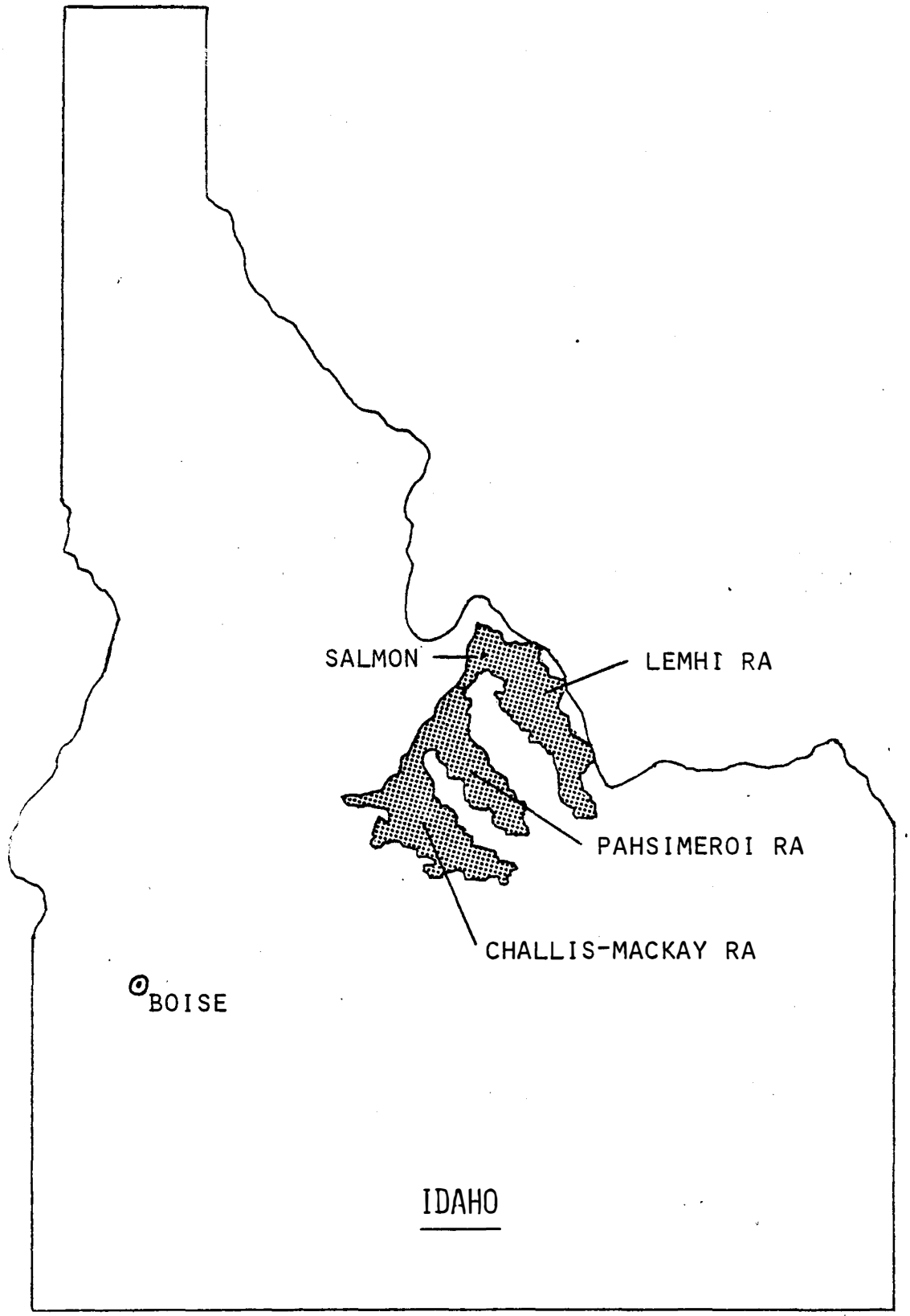

FIGURE 1 BUREAU OF LAND MANAGEMENT'S SALMON DISTRICT. RESOURCE AREAS (RA'S) ARE: LEMHI RA, PAHSIMEROI RA, AND CHALLIS-MACKAY RA.

A two-person crew surveyed areas selected from timberland maps in BLM's Eastern Idaho Sustained Yield Unit management program (Final EAR 1978). These surveyed areas were commercially forested, roaded, less than 160 acres in size, and classified as intensive timber management areas.

In the field, variable-radius (Basal Area Factor 10) and 1/100 acre fixed-radius plots were established with a common center point 1/10 mile into each newly surveyed timber management area. These plots were located two-chains into the forest and perpendicular to the right side of the road. If such a plot was non-forested (no trees), an attempt was made at plot establishment off the left side of the road. If both sides were non-forested, the plot was recorded as non-type and discarded without replacement for that plot interval. Intervals between plots within a management area were one mile.

In each variable plot a representative site tree was measured for height and bored at breast height to determine age. Such data was used to obtain the stand's site index |(height/age) X 100|. The following information was recorded for each BAF 10 variable plot tree: age, diameter at breast height (d.b.h.), height, species, dwarf mistletoe rating (DMR) (Hawksworth 1977), and condition live or dead. With the exception of d.b.h. and height, the same data was collected from the 1/100 acre fixed-radius plots from all trees less than five inches d.b.h. A blank plot survey field sheet is included in the Appendix.

Data Processing

Data from the plot surveys was used to obtain the incidence of both lodgepole pine and Douglas-fir dwarf mistletoes. Incidence is the percentage of plots found infected within a host type.

The RMYLD stand simulation model (Edminster 1978) was used to summarize the data and estimate merchantable cubic-foot volume loss of lodgepole pine stands due to dwarf mistletoe infections. The RMYLD model is structured to project 10-year volume production by stand. The model can also simulate the influence of dwarf mistletoe infections over time upon volume production.

Data from each infected lodgepole pine stand was run through the computer twice. The first run produced a 10-year projection of growth with the stand's actual DMR. The second run was with a DMR of 0.0, representing a mistletoe-free environment. If a difference occurred in merchantable cubic-foot volume projections, it was divided by 10 to estimate the annual cubic-foot growth reduction of the stand due to lodgepole pine dwarf mistletoe infections.

To assess growth reduction for infected lodgepole pine stands on a per-acre basis the commercial acreage listed in the aforementioned EAR was divided by the number of survey plots to determine acres per plot. This figure was then multiplied by the number of dwarf mistletoe-infected lodgepole pine plots to estimate the total acreage of infected lodgepole pine on the Salmon District. The cumulative annual growth reduction derived from RMYLD runs for all lodgepole pine plots was then divided by the number of infected lodgepole pine acres to estimate growth loss/acre/year.

RESULTS

Lodgepole pine

Thirty-eight percent of the surveyed lodgepole pine plots on the BLM Salmon District were infected with dwarf mistletoe (Table 1). Stand characteristics of infected stands include an average age of 99 years, a site index of 47, and an average DMR in the moderate level at 2.3 on the Hawksworth 6-class scale (Hawksworth 1977).

From the computer-simulated yields merchantable volume reduction on the Salmon District is estimated to be 57,240 cubic-feet per year (Table 1). Per infected acre, this figure represents an average of 10.6 cubic-feet per year.

Noteworthy for possible future management considerations are incidence and volume reduction estimates by stand structure. Thirty-eight percent of the pole-size plots and 39 percent of the sawtimber plots were infected by dwarf mistletoe. Annual volume reduction averaged 24.0 cubic-feet per acre for pole-size plots and 4.9 cubic-feet per acre for sawtimber plots (Table 2).

The occurrence of lodgepole pine found in the plot survey was minimal in both the Pahsimeroi and Challis-MacKay Resource Areas (Table 3). Consequently, most loss assessment data for the lodgepole pine type came from the Lemhi Resource Area.

Douglas-fir

Thirty-seven percent of the Douglas-fir stands in the survey were infected (Table 4). The highest percentage (38 percent) of Douglas-fir dwarf mistletoe incidence was in the Pahsimeroi Resource Area. Incidence was 32 percent for the Challis-MacKay Resource Area and 19 percent for the Lemhi Resource Area.

Fifty percent of the pole-size plots and 26 percent of the sawtimber plots were infected by Douglas-fir dwarf mistletoe (Table 5).

DISCUSSION

Although there is a considerable amount (38 percent of plots) of lodgepole pine dwarf mistletoe on BLM's Salmon District, incidence rates are higher for two of the three adjacent National Forests (Figure 2). The Salmon National Forest to the north and west has an incidence rate of 59 percent, and the Challis National Forest to the south and west has a rate of 45 percent (Hoffman and Hobbs 1979). The Beaverhead National Forest to the northeast has an almost identical rate of 37 percent plot infection (Dooling 1979).

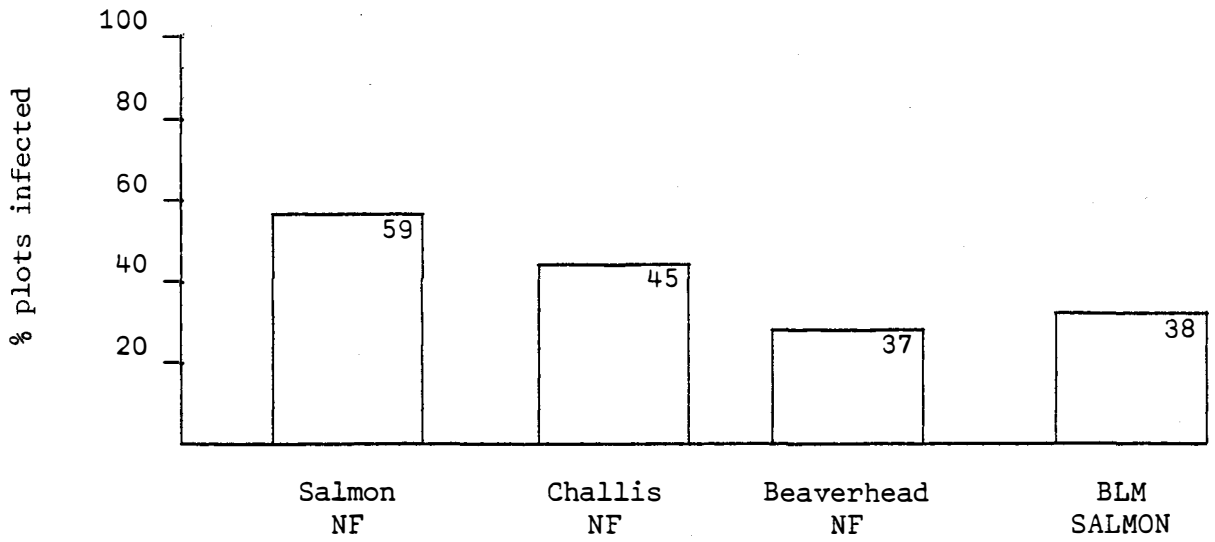

Figure 2. Comparative percentages of lodgepole pine plots with dwarf mistletoe infections.

As stated, the annual growth reduction from the lodgepole pine parasite is estimated to be 10.6 cubic-feet per acre. The BLM District's per-acre loss is less than that reported for the Salmon National Forest (18.9 cubic-feet/acre), but the same as the Challis National Forest (10.6 cubic-feet/acre) and greater than the Beaverhead National Forest (6.1 cubic-feet/acre) (Figure 3).

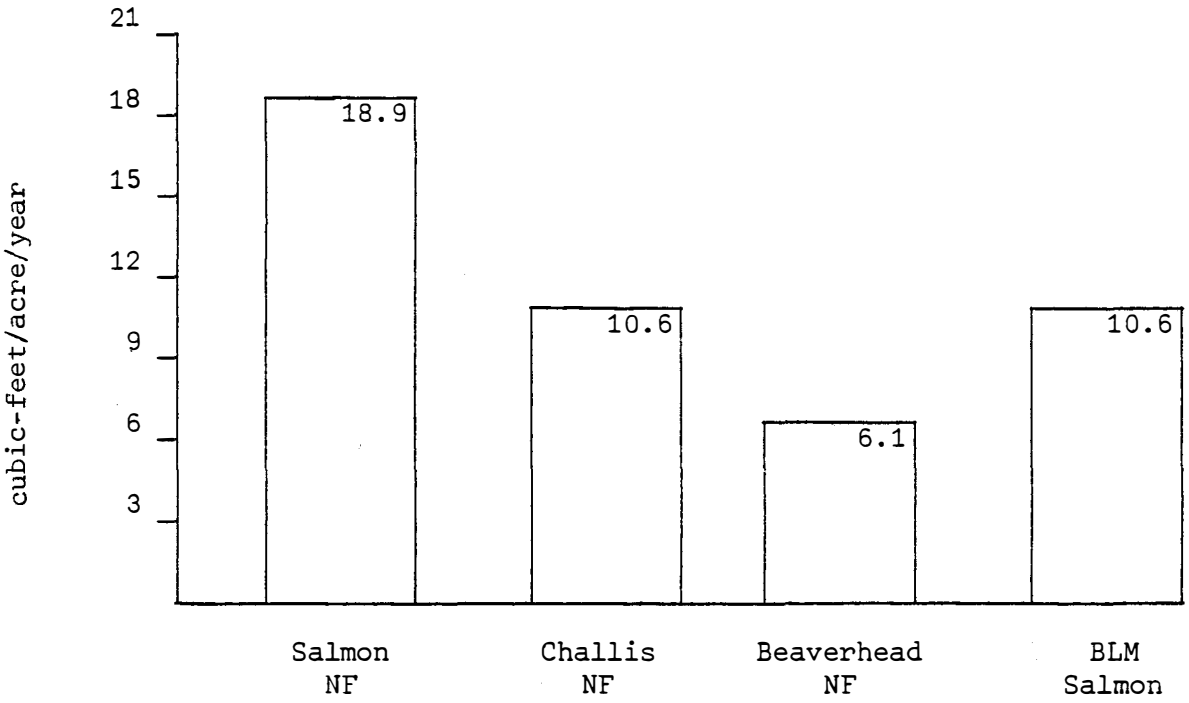

Figure 3. Comparisons of merchantable cubic-foot/acre/year volume loss from lodgepole pine dwarf mistletoe.

Since RMYLD simulations estimate little appreciable mistletoe-induced growth reduction for stands with average DMR's below 3.0 (Hawksworth 1961), and infected stands in this survey had an average DMR of 2.3, it is inferred that the onset of stand senescence is more likely the cause of the lower volume production estimates, thereby diminishing the influence of dwarf mistletoe infections.

With Douglas-fir the situation may be quite different because it comprises more than six times the forested acreage by percent than lodgepole on the Salmon District (Table 3). There are presently, however, no computer simulation models available to obtain estimates of growth reduction from Douglas-fir dwarf mistletoe infections. Research is needed to quantify such estimates.

Dwarf mistletoes are a significant problem to many areas of the BLM Salmon District and thereby warrant consideration when developing future silvicultural prescriptions. Specific guidelines (Schwandt 1977) have been established to aid the land manager in managing dwarf mistletoes in Idaho and would be useful in all of the Salmon District's Resource Areas.

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TABLE 1. Incidence and merchantable cubic-foot volume loss estimates due to dwarf mistletoe (DM) on lodgepole pine (LP) stands in BLM's Salmon District. Information based on plot survey data and RMYLD simulations.

Salmon District Resource Area	# of plots within LP type	% of LP plots with DM	Annual cubic-ft. volume loss	Volume loss ft^3/acre/year
Lemhi RA	21	38%	51,840	12.0
Pahsimeroi RA	3	67%	5,400	5.0
Challis-MacKay RA	2	0%	0	0.0
TOTAL DISTRICT	26	38%	57,240	10.6

TABLE 2. Dwarf mistletoe incidence and volume loss estimates for lodgepole pine stands in BLM's Salmon District by size class and Resource Area.

	Lemhi RA	Pahsimeroi RA	Challis-MacKay RA	Total Salmon District
% of survey area in poles[1/]	29	67	0	31
% of survey area in sawtimber[2/]	71	33	100	69
% of pole area infected	33	50	0	38
% of sawtimber area infected	40	100	0	39
Annual ft^3 vol. loss/acre pole	31.0	10.0	0	24.0
Annual ft^3 vol. loss/acre sawtimber	5.7	0.0	0	4.9
Total annual ft^3 vol. loss/acre LP	12.0	5.0	0	10.6

1/ Pole = 5.0 to 7.9 inches d.b.h.

2/ Sawtimber = greater than 8.0 inches d.b.h.

TABLE 3. Number of plots and percentage of total plots in survey by vegetative cover types and Resource Areas.

Species	Lemhi RA		Pahsimeroi RA		Challis-MacKay RA		Total Salmon District	
	#[1/]	%[2/]	#	%	#	%	#	%
Lodgepole pine	22	11.0	2	1.0	2	1.0	26	13.0
Douglas-fir	74	37.0	29	14.5	65	32.5	168	84.0
Other	3	1.5	0	0.0	3	1.5	6	3.0
TOTAL	99	49.5	31	15.5	70	35.0	200	100.0

1/ Number of plots in the Resource Area.

2/ Percentage of total plots on District.

TABLE 4. Percent incidence of dwarf mistletoe on Douglas-fir in BLM's Salmon District's Resource Areas. Information based on plot survey.

Salmon District Resource Area	# of plots within DF type	% of DF plots with DM
Lemhi RA	74	19%
Pahsimeroi RA	29	38%
Challis-MacKay RA	65	32%
TOTAL DISTRICT	168	27%

TABLE 5. Percent incidence of Douglas-fir stands infected with dwarf mistletoe in BLM's Salmon District by size class and Resource Area.

	Lemhi RA	Pahsimeroi RA	Challis-MacKay RA	Total Salmon District
% survey area in poles[1/]	5	7	9	7
% survey in sawtimber[2/]	95	93	91	93
% of pole area infected	25	0	83	50
% of sawtimber area infected	18	41	25	26

1/ Pole = 5.0 to 7.9 inches d.b.h.

2/ Sawtimber = greater than 8.0 inches d.b.h.

PLOT SURVEY DATA SHEET

BLM District _____ Road Segment # _____ Crew Init. _____

Planning Unit _____ Plot # _____ Date _____

Starting Point of Road Segment _____ Location (to nearest 1/20 mi. from starting point) _____

Site Index (Ht/Age x 100) _____ Age _____

Habitat Type _____

Tree No.	Variable Plot (BAF 10)					Fixed Plot (0.01 Ac)			
	DBH (in.)	Ht. (ft.)	Species	DMR	Cond. L. or D.	DBH (in.)	Species	DMR	Cond. L. or D.
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